NOTES ON SOME MINERALS AND ROCKS.

BY E. GOLDSMITH.

PIMELITE. The material was found by Mr. Theo. D. Rand on his property at Radnor, Delaware Co., Penna., at a moderate depth. It is soft and very finely micaceous, having an apple green color and is greasy to the feel. Specific gravity was found with the Thoulet solution to be 2·596.

Beneath the microscope it shows irregular outlines. Dichroism none. Interference colors brilliant. A cleavage is noticed in a direction apparently at right angles to the plates which give an inclined extinction on rotating the object. The mineral is therefore defined as crystallized and may belong to the monoclinic system.

It is not fusible. With carbonate of soda on charcoal it affords a black mass containing nickel. With the fluxes it shows silica, nickel and iron. Hydrochloric acid decomposes it on boiling, leaving some mixed sand; after repeated boiling with the acid the insoluble portion was found to be 31·1 per cent. of the whole mass.

The soluble part, which is supposed to be the pimelite, being so intimately mixed with the insoluble impure sand, I analyzed quantitatively with the following result:

Silica	45·93 per cent.	O=24·49	
Magnesia	34·44 per cent.	O=13·77	
Nickeloxid	7·69 per cent.	O= 1·66	=25.81
Water	11·68 per cent.	O=10·38	

Which gives the ratios of SiO_2 : RO : : 1 : 1·05. A unisilicate, which may be represented in this form: $(Mg_x + Ni_y + H_z)\ O \cdot SiO_2$.

If ever the mineral pimelite is found and analyzed in a purer state it may possibly have the above composition; but the Radnor mineral is a mixture.

ASBEFERRITE. This variety of amphibole occurs mixed with cobalt and nickeliferous pyrites on calcite. It occurs abundantly as a secondary product in the iron mine near the Falls of French Creek, Chester Co., Penna. It is mostly on the calcite, but some of it has crystallized within it, giving the calcite a greenish tint. The asbeferrite, when dry, has a faint green color; if wet, as it comes out of the mine, it appears dark green. The best designation may be

grayish-green. Apparently it is amorphous macroscopically, in reality crystallized in fine fibres which lie in all directions as if felted together. The crystals as seen under the microscope are mostly very thin and appear colorless, but those which are thicker show a green color and with one nicol prism; when the object is rotated, a second color, yellow, is observed. The thicker crystals are therefore dichroic. These latter, when viewed parallel with the orthodiagonal plane, show this dichroic property particularly, but it is extinguished parallel to their longer axis, between the crossed nicols. The extinction parallel to the clinodiagonal I determined to be equal to—28°. The color of interference of this latter plane was a bright yellow, but parallel to the orthodiagonal it was blue. These optical characters indicate that this variety of amphibole is monoclinic.

The hardness is not determinable. Specific gravity=2·6.

Heated in the oxidizing flame it assumes a rusty color, fusing with difficulty to a black mass; in the reducing flame it becomes gray. With the fluxes iron and silica are indicated.

The analytical result was as follows:

SiO_2.....48·45 per cent.
Fe_2O_3.....33·90 per cent.
CaO.....11·80 per cent.
MgO..... 6·23 per cent.

A trace of manganese was observed but not determined quantitatively.

The composition of byssolite of Saussure is nearly the above, but this variety occurs as stiff, shining, bristle-like crystals, not felt-like as is the case with the dull, soft material under discussion. At any rate it is but a variety of amphibole and compares better with the Scandinavian mineral asbeferrite.

CACOXENITE. This species occurs on limonite at Beartown, Lancaster Co., Penna. The reddish-yellow radiating tufts are made up of very fine, fragile crystals whose hardness cannot be determined. It is entirely soluble in nitric acid, and the solution gives reactions for phosphoric acid and iron. It also contains water.

Beneath the microscope the orthorhombic forms are clearly observable, as (110) (001). They are dichroic; gray when parallel with the lower nicol and yellow when at a right angle to it. Between the crossed nicols superb interference colors of orange, yellow, blue and violet appear. This seems singular because the crystals do not

show much difference in thickness. Extinction invariably parallel to the longer axis.

Sericite-schist, also called hydromica schist, has been observed on several outcrops about one mile north of Berwyn, Pa. It is a glistening soft schistose rock much interspersed with quartz. Parallel to the layers it is smooth and fatty to the touch; at right angle to it, rather sharp and rough. It is so brittle that transparent sections are difficult to make.

With the microscope the section gave indications of the fragmental nature of its constituents. These are the peculiar leaflets of sericite, very irregular in outline and in distribution, and fragments of a feldspar, which is probably orthoclase, and quartz. As accessories I found some chlorite having faint dichroic properties playing between green and brown. A multitude of acicular crystals is strewn through the mass which seem to be apatite. Phosphoric acid and lime were found by chemical tests.

AMPHIBOLITE. This is a perfectly black rock found at Swarthmore, Delaware Co., Penna. There are lines which indicate stratification and it may be therefore of metamorphic origin. The fracture is curved. The hand specimen is of an even, crystalline structure throughout the mass, but the crystals are not lying all in the same direction. It is very compact and sound without any sign of weathering or decomposition. It is apparently nothing but amphibole, so far as the ordinary vision goes. In thin section, however, there are, beside the amphibole, small irregular shaped fragments of feldspar, mica and quartz, and magnetite in fair quantity.

GABBRO-PHONOLITE. Mr. Theo. D. Rand showed me in a not very deep ravine near Radnor Station, Delaware Co., Penna., a rock of very dark color, fine-grained and tough which had not been determined. He is of the opinion that the rock is in its original position, which may be correct, although I have not been able to see the proofs of it. It seems to me to be an isolated boulder.

If struck with the hammer it does not give a metallic sound, but its mineralogical composition seems to indicate a phonolite. The thin section magnified 100 diameters gave the following result: Figure 1, sanidine, plagioclastic feldspar, diallage and magnetite.

PHONOLITE. About a mile east of French Creek Falls Station, Chester Co., Penna., occurs a dyke whose rock splits in slabs after heating it and marking with the chisel and hammer the direction in which the division shall take place. I have seen plates of $\frac{1}{4}$ inch in

thickness. When struck with a hammer it gives a clear metallic sound; even the knuckles or the finger nails produce an audible ring. It is fine grained, compact, tough, rough to the touch and of dark gray color; not weathered.

The thin section exhibits under ordinary light much colorless material with some dark, irregularly outlined patches. Dichroism hardly any. Between the crossed nicols the following minerals became visible: Plagioclastic feldspar, sanidine, augite, diallage, amphibole, ilmenite with borders of leucoxene. Glass was not found.

Similar thin slabs of the same material were found in two other localities. The one near the dyke at Schwenksville near Perkiomen Creek and the other on the dyke near Tylersport, Montgomery County, Pa. Both slabs were about ½ inch thick and weathered. The mere touch with the fingers emitted a sound. The mineral composition in general is the same as the rock from Little French Creek Falls.

AN ALTERED PHONOLITE. A flat slab, of about a ¼ inch in thickness, having the appearance of micaceous gneiss and a decided metallic sound when touched or struck was found not far from the dyke at West Conshohocken, Montgomery County, Pa. A thin section observed under the microscope indicated a glassy feldspar having the characters of sanidine. This latter species was compared with the sanidine bearing trachyte from Sicily and Vesuvius and seems to be identical therewith. Besides this glassy orthoclastic feldspar a mica and quartz are present. There are also some very thin fibrous microlites, which are probably a silicate, and ferric oxid. In the whole the mixture of minerals present in this peculiar slab is fine grained and very brittle. If the glassy feldspar should prove to be true sanidine, the rock would be a new variety of gneiss, and, since sanidine occurs only in eruptive rocks a somewhat singular derivation would be indicated. It is evident that the glassy feldspar resists the action of metamorphic influences longer than the plagioclastic feldspars; the latter having entirely disappeared in this altered phonolite, being, as it seems,changed into mica and quartz. This is believed to be possible, since labradorite contains about 53 per cent. of silica, muscovite 46 per cent. The difference of the silica would be liberated and, in the course of time crystallize into quartz.

GABBRO-PHONOLITE. About ten miles east of Quakertown, Bucks County, Pa., a conical hill rises, named by the people, Haycock Mountain. On the slope, near the top of this hill, is an outcrop of

igneous rock in the form of slabs and huge boulders. These were generally called trap by our geological friends, but the people call them ringing rocks; or, what means the same, klinkstones. The exposure is a large one, but, on inspection it was found that the trees encroach upon it and have already conquered a considerable area of the outcrop. They will probably in time cover the entire locality which is called the Stony Garden by the people who go there on picnics.

The klinkstones, as they are called (or, more properly speaking phonolites), produce a metallic sound when struck by a hammer. and the sound differs with almost every block or slab.

It is known that these rocks are basic in their chemical relations and this fact was fully established by my having, after a careful examination of some specimens, obtained 52·15% of silica (SiO_2.)

These phonolites, if not affected by atmospheric influence, are of a dark color; but they become ash-gray externally whenever exposed to the air. They are tough and mostly fine-grained; so much so that, macroscopically, it is utterly impossible to determine their mineralogical composition, although, with the aid of the pocket lens, a few crystals may be seen. The thin section (fig. 2) had to be magnified 100 diameters to make the components visible. It was compared with standard rock slides: diallage, plagioclastic feldspar, sanidine, amphibole and magnetite.

Inasmuch as the composition embodied in these rocks constitutes a gabbro, I have proposed the name gabbro-phonolite for this, the first American phonolite.

Another dyke of phonolite, of essentially the same character and of nearly the same composition, is exposed in Bucks County near the Delaware River, opposite Holland Station, New Jersey.

Three miles north of Pottstown, Montgomery County, Pa., is a fine exposure of the same kind of phonolite as described above. The people of the town call it the Ringing Hill. As it is easily reached it is used as a pleasure grove. The encroaching trees will, in all probability cover the entire outcrop, the greater part having already been covered up.

In Pl. II, figure 3, I have tried to illustrate a thin section of gabbro-phonolite collected from the dyke through which the North Pennsylvania Railroad passes. The point is about two miles north of Quakertown, Bucks County, Pa. A description may appear superfluous because the composition is so nearly like the one from

Haycock Mountain except that the sound emitted is not so highly metallic as in the case of the latter. There are, however, twins of diallage in the section which will easily be recognized by those interested in the subject. The sanidine is present in less quantity than the plagioclastic feldspar which seems to be labradorite. Huge blocks, rounded by weathering, occur in the neighboring fields in great abundance. Specimens collected and studied in the same way, gave the same general results, and have therefore not travelled any great distance.

Mr. Theo. D. Rand collected two specimens of rock which he submitted to me for determination. The one was found at Buck Run, 2 miles southwest of Mortonville, Chester County, Pa.; and the other from 2 miles south-southeast of Thorndale, Chester County, Pa. Both specimens proved to be the same kind of gabbro-phonolite. Slight differences are noticed in the Mortonville rock; beside the sanidine, plagioclastic feldspar, the diallage and augite, there is some hematite beside the magnetite.

The Thorndale rock is the same in composition except that some chlorite was recognized in the mixture.

GRANULITE. The specimen was collected in the quarry at Pigeon Cove, Mass., by Mr. Theo. D. Rand who told me that the quarrymen complained of the extreme hardness of the rock, which they could not account for. I was requested to investigate it and to ascertain what the cause of the extreme hardness might be.

The hand specimen is a coarse grained, mostly light colored rock intermixed irregularly with large black patches having a metallic lustre. The rock contains no mica.

The thin section (Pl. II, fig. 4) as observed beneath the microscope showed the constituent minerals to be orthoclastic feldspar, quartz and magnetite. It is essentially the same rock which is so extensively used in Philadelphia for Belgian block pavements.

The feldspar and the quartz are interpenetrated and can be best recognized by reflected light; when so examined the quartz appears dark and the feldspar light. With the aid of the polarized ray the interference phenomena of the two mineral species are clearly shown; the reflected ray however, shows it to the best advantage especially for the shading in the illustration. The contour was drawn with the pen and the aid of a rectangular prism (Dr. Piffards) which projects the picture of the slide upon the paper. Under these conditions the contour can be drawn with accuracy and ease, provided

one has enough light. The section as drawn shows how intimately the quartz and feldspar are mixed. The two species are so commingled as to indicate that they must have crystallized simultaneously, the greater hardness seeming to be due to a somewhat greater proportion of quartz.

Explanation of Plates I and II.

Figure 1. Gabbro Phonolite, Radnor. Magnified 100 diameters shows, (1) Sanidine, (2) Plagioclastic Feldspar, (3) Diallage, (4) Magnetite.

Figure 2. Gabbro Phonolite, 10 miles east of Quakertown. $\times$ 100; (1) Diallage, (2) Plagioclastic Feldspar, (3) Sanidine, (4) Amphibole, (5) Magnetite.

Figure 3. Gabbro Phonolite, north of Quakertown, $\times$ 15; (1) Diallage, (2) Plagioclastic Feldspar, (3) Magnetite, (4) Amphibole, (5) Sanidine.

Figure 4. Granulite, Pigeon Cove, Mass. $\times$ 15; (1) Orthoclastic Feldspar, the dark portion quartz, (3) Magnetite.

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